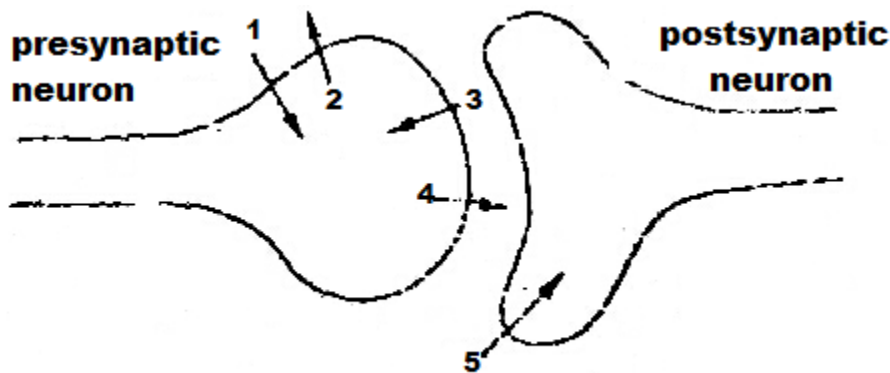


FMDC 2016 Original Paper

Biology:

1. A student is trying to determine the type of membrane transport occurring in a cell. She finds that the molecules to be transported is very large and when transported across the membrane, no ATP is used. Which of the following is the most likely mechanism of transport?
 - A) Active transport
 - B) Simple diffusion
 - C) Facilitated diffusion
 - D) Exocytosis
2. In the course of glycolysis
 - A) NADH is reduced to NAD^+
 - B) NAD^+ is oxidized to NADH
 - C) Glucose is degraded into two molecules
 - D) Both A & B
3. The epiglottis is to trachea as the lower esophageal (cardiac) sphincter is to the:
 - A) Stomach
 - B) Heart
 - C) Small intestine
 - D) Liver
4. Starch is hydrolyzed into maltose by:
 - A) Salivary amylase
 - B) Maltase
 - C) Pancreatic amylase
 - D) Both A & B
5. Which of the following best describes the residual volume of the lungs?
 - A) The amount of air normally inhaled and exhaled with each breath.
 - B) The maximum amount of air that can be forcibly inhaled and exhaled from the lungs.
 - C) The volume of air that can still be forcibly exhaled following a normal exhalation.
 - D) The volume of air that always remains in the lungs.
6. The diagram show the sequence of events occurring as an action potential arrives at a synapse.

The numbered arrows represent movement of substances across the membranes.



What are the substances moving across the membranes?

	1	2	3	4	5
A	K ⁺	Na ⁺	Acetylcholine	Ca ²⁺	K ⁺
B	K ⁺	Na ⁺	K ⁺	Ca ²⁺	Acetylcholine
C	Na ⁺	K ⁺	Ca ²⁺	Acetylcholine	Na ⁺
D	Na ⁺	K ⁺	Na ⁺	Acetylcholine	Ca ²⁺

7. Arthropods can be characterized by all of the following EXCEPT:
- A hard exoskeleton
 - A water vascular system
 - Joined appendages
 - Molting
 - Segmented body
8. The role of decomposers in the nitrogen cycle is to:
- Fix atmospheric nitrogen into ammonia
 - Incorporate nitrogen into amino acids and organic compounds
 - Convert ammonia to nitrate, which can then be absorbed by plants
 - Denitrify ammonia, thus returning nitrogen to the atmosphere
 - Release ammonia from organic compounds, thus returning into the soil
9. Black coat color in horses is caused by a dominant allele, while white coat color is due to the recessive allele. Two black horses produce a foal with white coat, if they were produce a second foal, what would be the probability of the second foal having a black coat?
- 0
 - 1/0
 - 1/2
 - 1/4
 - 1
10. Organisms that live in the intertidal zone might have which of the following characteristics?
- Ability to conduct photosynthesis
 - Tolerance of periodic drought

- iii. Tolerance of wide range of temperatures
- A) I only
 - B) II only
 - C) I and III only
 - D) II and III only
 - E) I, II, and III
11. In floral formula "K" stands for:
- A) Corolla
 - B) Calyx
 - C) Perianth
 - D) Androecium
 - E) Gynoecium
12. "Hordeum vulgare" is the botanical name of:
- A) Wheat
 - B) Oats
 - C) Rice
 - D) Barley
 - E) Bajra
13. The usual duration of luteal phase in the menstrual cycle of human female is:
- A) 4-6 days
 - B) 8-10 days
 - C) 12-14 days
 - D) 10-12 days
14. Response to plants to touch is called:
- A) Geotropism
 - B) Thigmotropism
 - C) Nasticism
 - D) Mechanoreception
15. Select the false statement:
- A) All fungi are saprophytic
 - B) Mycology is the study of fungi
 - C) Fungi are non coenocytic
 - D) Puccinia is a obligate parasite
16. Photosynthetic product from leaves to all parts of plant are disturbed through:
- A) Vascular bundles
 - B) Phloem
 - C) Xylem
 - D) Stomata
 - E) None of the above
17. In the F_2 generation of a dihybrid cross between yellow, round seeded and green, wrinkled seeded pea plants, 17 out of 254 seeds were green and wrinkled other seeds were:
- Yellow and round

Green and round

Yellow and wrinkled

What do these results indicate?

- A) Crossing-over has occurred
 - B) Green and wrinkled are both recessive characters
 - C) The alleles for green and wrinkled are linked
 - D) The allele for green is recessive but not the allele for wrinkled
 - E) The allele for wrinkled is recessive but not the allele for green
18. Duck bill platypus and spiny anteater have internal fertilization and are:
- A) Ovoviviparous
 - B) Viviparous
 - C) Oviparous
 - D) None of the above
19. Nematocysts are characteristics of:
- A) Porifera
 - B) Protozoa
 - C) Cnidarians
 - D) Annelida
 - E) Echinodermata
20. Which of the following is an acceptable nitrogen base composition for double stranded DNA?
- A) 31% A; 19% T; 31% C; 19% G
 - B) 36% A; 36% U; 24% C; 24% G
 - C) 48% A; 48% T; 52% C; 52% G
 - D) 31% A; 31% T; 19% C; 19% G
 - E) 24% A; 24% U; 36% C; 19% G
21. The correct order of the structures through which air passes is
- I. Nasal cavity
 - II. Bronchi
 - III. Larynx
 - IV. Air sacs
 - V. Trachea
- A) I, V, III, II, IV
 - B) I, V, III, IV, II
 - C) I, III, IV, V, II
 - D) I, III, V, IV, II
 - E) I, III, V, II, IV
22. Which of the following pathways outlines the order of events during aerobic cellular respiration?
- First → Last
- A) Glucose → triose phosphate → Pyruvate → Kerbs cycle → $CO_2 + H_2O + ATP$

- B) Glucose \longrightarrow triose phosphate \longrightarrow Pyruvate \longrightarrow Kerbs cycle \longrightarrow
 $CO_2 + H_2O + ADP + PI$
- C) Glucose \longrightarrow hexose phosphate \longrightarrow Pyruvate \longrightarrow Kerbs cycle \longrightarrow
 $CO_2 + H_2O + ADP + PI$
- D) Glucose \longrightarrow hexose phosphate \longrightarrow Pyruvate \longrightarrow Kerbs cycle \longrightarrow
ethanol + $CO_2 + ATP$
23. The diameter of a tree is reduced slightly during the day and increased at night. Which of the following changes in environment condition cause the greatest reduction in diameter?
- A) Increase in wind velocity, temperature, humidity and light intensity
B) Increases in temperature, humidity and light intensity
C) Increases in wind velocity, humidity and light intensity
D) Increases in wind velocity, temperature and light intensity
E) Increases in wind velocity temperature and humidity
24. Why is there no glucose present in filtrate the distal of a nephron?
- A) Glucose molecules are too large to pass cross the basement membrane
B) Glucose removed by osmosis from the tubule
C) Glucose is passively absorbed by the cells lining the descending loop of Henle.
D) Glucose is actively absorbed by the proximal tubule cells.
25. Which of the following is the stage of meiosis during which pairs of homologous chromosomes align at the center of the cell?
- A) Anaphase II
B) Metaphase I
C) Prophase II
D) Metaphase I
E) Prophase I
26. The tricuspid valve prevent backflow of blood from the:
- A) Left ventricle into the left atrium
B) Aorta into the left ventricle
C) Pulmonary artery into the right ventricle
D) Right ventricle into the right atrium
27. The liver:
- A) Decreases blood glucose levels
B) Increase blood glucose levels
C) Synthesizes glucose
D) All of the above are function of the liver
28. At which two points of the menstrual cycle are the level estrogen heights?
- A) Immediately before and after ovulation
B) At ovulation and during the menstrual flow
C) During the menstrual flow and pregnancy
D) Pregnancy and after menopause

29. Herpes is a virus that enters the human body and remains dormant in the nervous system until it produces an outbreak, without any particular reason. Which of the following statements correctly describes herpes?
- A) While it remains dormant in the nervous system, the virus is in its lysogenic cycle
 - B) During an outbreak the virus is in the lytic cycle
 - C) Herpes integrates itself into the DNA of the cell
 - D) All of the above
30. Which of the following statements could not be used to describe a species?
- A) A group of organism showing distinctly similar autosomes
 - B) A group of organism showing analogous body structures
 - C) A group of organism capable of mating to produce viable offspring
 - D) A group of organisms sharing the same ecological niche
 - E) A group of organisms sharing unique structural and functional characteristics

PHYSICS:

31. A frictionless heat engine can be 100% efficient only if its exhaust temperature is:
- A) Double of its input temperature
 - B) Half of its input temperature
 - C) Equal of its input temperature
 - D) 100%
 - E) OK
32. The vector which only specifies the direction of a given vector is called:
- A) Free vector
 - B) Position vector
 - C) Null vector
 - D) Unit vector
33. A ball is thrown vertically upward with velocity of 196 m/s. How high does the ball rise?
- A) 1960 meters
 - B) 2960 meters
 - C) 1000 meters
 - D) 1100 meters
34. "If there is no external force applied to a system, then the total momentum of that system remains constant". This is known as:
- A) Law of conservation of mass
 - B) Elastic collision
 - C) Law of conservation of momentum
 - D) Momentum of body
35. A car traveling at a constant speed of 90 km/h rounds a curve of a radius 100m. What is its acceleration?
- A) 4.0 m/sec^2
 - B) 6.25 m/sec^2

- C) 6.5 m/sec^2
D) 4.5 m/sec^2
E) 7.5 m/sec^2
36. A boy on a 20 m high cliff drops a stone. One second later, he throws down another stone. Both the stones hit the ground simultaneously. Find the initial velocity of the second stone. ($g=10/s^2$)
A) 5 m/s^2
B) 10 m/s^2
C) 15 m/s^2
D) 20 m/s^2
E) 30 m/s^2
37. An elevator, in which a man is standing is moving upward with a constant speed of 10 m/s^2 . If the man drops a coin from a height of 2.5 m, find the time taken by it to reach the floor of the elevator ($g=9.8 \text{ m/s}^2$)
A) 0.707 s
B) 1.9 s
C) 3.1 s
D) 6.17 s
E) 7.15 s
38. A 100 kg man runs up a hill through a height of 4m in seconds. How much work does he do against gravitational force?
A) 2060 J
B) 3920 J
C) 5000 J
D) 5290 J
39. Which statement describes the electrical potential difference between two points in a wire carrying a current?
A) The force required to move a unit positive charge between the points
B) The ratio of the energy dissipated between the points to the current
C) The ratio of the power dissipated between the points to the current
D) The ratio of the power dissipated between the points to the charge moved
E) None of the above
40. Find the time period of a simple pendulum whose length is 88.2 cm. The value acceleration due to gravity is 9.8 m/s^2 at the place where experiments is performed?
A) 1.885 sec
B) 1.233 sec
C) 2.05 sec
D) 4 sec
41. A light bulb has resistance of 1500, find the voltage while the current is 1.5A?
A) 250 v
B) 300 v
C) 224 v
D) 225 v

42. An object that's moving with constant speed travels around a circular path. Which of the following is/are true concerning this motion?
- I. The displacement is zero
 - II. The average speed is zero
 - III. The circulation is zero
- A) I only
 - B) I and II only
 - C) I and III only
 - D) III only
 - E) II and III only
43. A system absorbed 80 J through heating while doing 100 J of external work, what is the change in the internal energy of the system?
- A) -100 J
 - B) -20 J
 - C) +80 J
 - D) +180 J
44. A region around a charge body in which another charge experiences an electric force is called:
- A) Electric flux
 - B) Electric field
 - C) Electric potential
 - D) Capacitance
45. A convex lens of focal length 40 cm is in contact with a concave lens of focal length 25 cm. the power of the combination in dioptres is :
- A) -1.5
 - B) -6.5
 - C) +6.5
 - D) +6.67
 - E) -7.7
46. A simple pendulum suspended from the ceiling of a train has a period 'T' when the train is at rest. When the train is accelerating with a uniform acceleration, the time period of simple pendulum will:
- A) Decrease
 - B) Increase
 - C) Remain unchanged
 - D) Become infinite
 - E) Insufficient information
47. Lenz's law states that:
- A) The flow of a fluid in a medium under same applied force experiences some sort of friction or resistance in its path
 - B) A body remains at rest or continues to move with uniform velocity unless acted upon by an unbalanced force

- C) The induced current always flows in such a direction as to oppose the change which is giving rise to it
- D) When a particle bearing a charge q and moving with a velocity V enters the region of a uniform magnetic field of induction B , it is acted upon by a force
48. Two rail cargo cars are being hitched together. The first car has a mass 15,750 kg and is moving at a speed of 4 m/s toward the calculate the final velocity of the two cars.
- A) 1.8 m/s
- B) 3.8 m/s
- C) 5.8 m/s
- D) 7.8 m/s
- E) 9.8 m/s
49. Two capacitors $C_1 = 2_u F$ are connected series across a 100 V supply. Find the effective capacitance.
- A) $1/2_u F$
- B) $3/2_u F$
- C) $4/3_u F$
- D) $7/2_u F$
- E) $9/2_u F$
50. Consider two equal resistors wired in parallel. What is the equivalent resistance of the two?
- A) $3R/2$
- B) $R/2$
- C) $R/3$
- D) $R/5$
- E) $R/7$
51. A detector with a surface area of 1 square meter is placed 1 meter from an operating jackhammer. It measures the power of jackhammer's sounds as being $10^{-3} W$ find the intensity of the jackhammer.
- A) 10 W/m
- B) $10^{-3} W/m^2$
- C) $10^{-9} W/m^2$
- D) $10^{-7} W/m^2$
- E) $10^{-9} W/m^2$
52. Ultra violet light is more likely to cause a photoelectric effect than a visible light. This is because photons of ultraviolet light :
- A) Have a longer wavelength
- B) Have a higher velocity
- C) Are not visible
- D) Have a higher energy
53. If an object is released 19.6 meter above the ground, how long does it take the object to reach the ground? ($g=9.8 m/s^2$)
- A) 1 seconds
- B) 2 seconds

- C) 6 seconds
D) 8 seconds
E) 10 seconds
54. Two tuning forks are sounded one has a frequency of 250 Hz while the other has a frequency of 245 Hz. What is the frequency of the beats?
A) 250 Hz
B) 245 Hz
C) 5 Hz
D) 10 Hz
E) 235 Hz
55. A rock is dropped from a high bridge at the end of 3 seconds of free fall the speed of the rock in cm/s:
A) 30
B) 100
C) 500
D) 1000
E) 2940
56. A body rolling freely on the surface of the earth eventually comes to rest because
A) It has mass
B) It suffers friction
C) It has inertia of rest
D) It has a momentum
E) It is gravitation less because it is already on the surface.
57. A 1000 kg car can accelerate from rest to speed of 25 m/s in 10s. what average power (in kilo watts) must the engine of the car produce in order to cause this acceleration? Neglect the friction loss.
A) 33.25
B) 3625
C) 48.44
D) 3125
E) 31,25
58. The kinetic energy of a projectile at the highest point is half of its kinetic energy. The angle of projection is
A) 0°
B) 30°
C) 60°
D) 45°
E) 90°
59. A small and a large rain drops are falling through air
A) The small drop will evaporate
B) The large drop moves faster
C) The small drop moves faster
D) Both move with the same speed

- E) No conclusion can be drawn unless the exact sizes of the drops are known
60. A container is divided into two equal portions. One portion contains an ideal gas at pressure P and temperature T while the other portion is a perfect vacuum. If a hole is opened between the two portions
- A) There will be a change in internal energy
 - B) There will be a change in temperature
 - C) There will be no change in internal energy
 - D) The external pressure will increase
 - E) The external pressure will decrease

CHEMISTRY:

61. Which gaseous hydride most readily decomposes into its elements on contact with a hot glass rod?
- A) Ammonia
 - B) Hydrogen chloride
 - C) Hydrogen iodide
 - D) Steam
62. A hydrocarbon, which is a liquid at a room temperature, decolourises aqueous bromine. What could be the molecular formula of the compound?
- A) C_2H_2
 - B) C_2H_4
 - C) C_7H_{16}
 - D) $C_{10}H_{20}$
 - E) $C_{12}H_{26}$
63. Bleaching powder is a good:
- A) Hydrating agent
 - B) Oxidizing agent
 - C) Dehydrating agent
 - D) Reducing agent
64. The value of the enthalpy change for the process represented by the equation $Na(s) \longrightarrow Na^+(g) + e^-$ is equal to :
- A) The first ionization energy of sodium
 - B) The enthalpy change of vaporization of sodium
 - C) The sum of the enthalpy change of the atomization and the first ionization energy of sodium
 - D) The sum of the enthalpy change of atomization and the electron affinity of sodium
65. Which statement about one mole of metal is always correct?
- A) It contains the same number of atoms as 1 mole of hydrogen atoms.

- B) It contains the same number of atoms as $1/12$ mole of ^{12}C .
C) It has the same mass as 1 mole of carbon atoms
D) It is liberated by 1 mole electrons
66. As the atomic number increases in a group, the chemical properties:
A) Change
B) Stay roughly the same
C) Decrease
D) Increase
67. The crystals formed as a result of Van der waals interactions are:
A) Molecular crystals
B) Covalent crystals
C) Metallic crystals
D) Ionic crystals
68. All the following are the true statement concerning catalyst EXCEPT:
A) A catalyst will speed up the rate determining step.
B) A catalyst will be used up in a reaction
C) A catalyst may induce steric strain in a molecule to make it react more readily
D) A catalyst will lower the activation energy of reaction
69. Which of the following processes is endothermic?
A) The condensation of steam
B) The electrolysis of water
C) The freezing of the water
D) $\text{Ca}(s) + 2\text{H}_2\text{O}(l) \longrightarrow \text{Ca}_2(\text{aq}) + \text{H}_2(\text{g})$
E) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \longrightarrow \text{H}_2\text{O}(l)$
70. Which reagent gives a colorless homogeneous solution when added to phenol?
A) Aqueous bromine
B) Aqueous sodium carbonate
C) Aqueous sodium hydroxide
D) Aqueous sodium hydroxide and benzoyl chloride
71. Which substances has tetrahedral geometry?
A) Benzene
B) Methane
C) Cyclohexene
D) None of the above
72. The _____ free radical takes part in the destruction of the ozone layer.
A) Chlorine
B) Helium
C) Neon
D) Xenon
73. How many atoms of carbon are present in 18 g of glucose, $\text{C}_6\text{H}_{12}\text{O}_6$?
A) 6.0×10^{22}
B) 3.6×10^{23}
C) 6.0×10^{23}

D) 3.6×10^{24}

E) 6.0×10^{24}

74. Which property of a gas affects the rate at which it spreads throughout a laboratory?

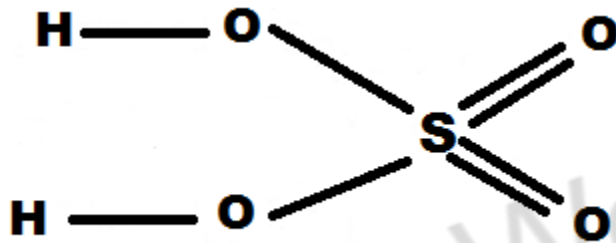
A) Boiling point

B) Molecular mass

C) Reactivity

D) Solubility in water

75. The bonding in sulphuric acid can be represented by the structure shown



What is the total number of electrons in the covalent bonds surrounding the sulphur atom?

A) 4

B) 6

C) 8

D) 12

76. One mole of an organic compound is completely burnt in oxygen. Which compound produces exactly three moles of water?

A) Butane C_4H_{10}

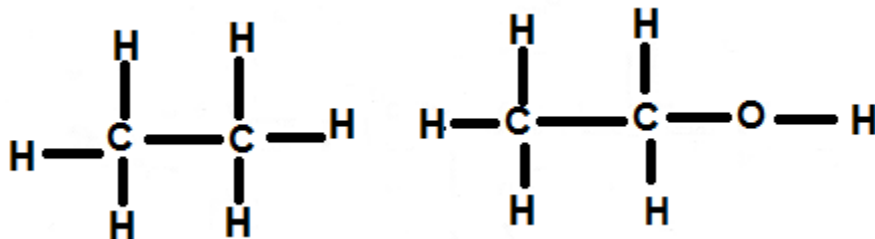
B) Butanol C_4H_9OH

C) Ethanol C_2H_5OH

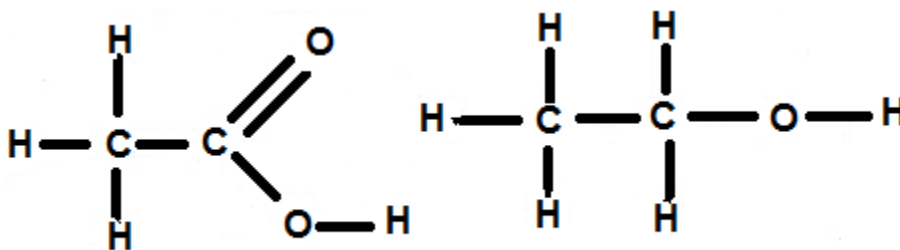
D) Propane C_3H_8

77. Which pair of structures are isomers of each other?

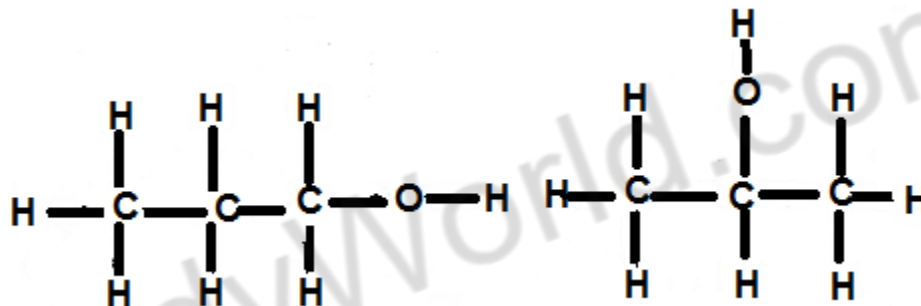
A)



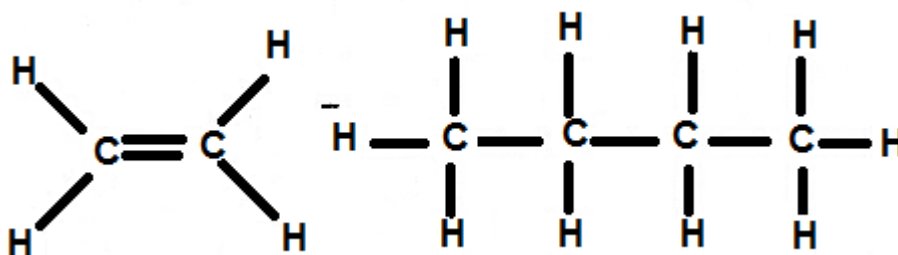
B)



C)



D)



78. When must a substances be an alkane?

- A) When it burns in air or in oxygen
- B) When it contains carbon and hydrogen only
- C) When it has the general formula $C_n H_{2n+2}$
- D) When it is generally un-reactive

79. Which statement shows that diamond and graphite are allotropes of carbon?

- A) Both have giant molecular structures
- B) Complete combustion of equal masses of carbon dioxide as the only product
- C) Graphite conducts electricity, whereas diamond does not

- D) Under suitable conditions, graphite can be converted into diamond
80. If Auf.bau rule is not followed in filling of the sub shell then the block of which elements will change in the periodic table.
- A) K (19)
 - B) Se (21)
 - C) V (23)
 - D) Ni (28)
81. Which gas shows real behavior?
- A) 8 g O₂ at 5.T.P occupies a volume of 5.6 lit
 - B) 1g H₂ in 0.5 lit flask exerts pressure of 24.63 atm at 3.. K
 - C) 1 mole NH₃ at 3.. K and 1atm occupies volume 22.4 lit
 - D) 5.6 lit of CO₂ at STP is equal to 11 g
82. Heat of neutralization of strong acid by strong base is constant value because
- A) Salts formed does not hydrolyze
 - B) Only H⁺ and OH ions react in every case
 - C) Strong base and strong acid react completely
 - D) Strong base and strong acid react in aqueous solution
83. Compared with alkaline earth metals the alkali metals exhibit
- A) Smaller ionic radii
 - B) Greater hardness
 - C) High boiling point
 - D) Lower ionization energy
84. The number and types of bonds between two carbon atoms in CaC₂ are
- A) One sigma and one pi bonds
 - B) One sigma and two pi bonds
 - C) Two sigma two bonds
 - D) One sigma bond
85. The alloy of copper and tin is called
- A) Brass
 - B) Bronze
 - C) German silver
 - D) Metal
86. Which of the following is not an electrophile?
- A) NH₃
 - B) BI³
 - C) ALCL₃
 - D) Hg²⁺
87. How many isomers are possible for the compound having molecular formula C₃H₅Br
- A) 5
 - B) 4
 - C) 6
 - D) 8

88. Which xylene is most easily sulphonated
- A) Ortho
 - B) Para
 - C) Meta
 - D) All at the same rate
89. Which one of the following is likely to give a precipitate with $AgNO_3$ solution?
- A) CCl_4
 - B) $CHCl_3$
 - C) $CH_2=CHCl$
 - D) $(CH_3)_3CCl$
90. In Sp^3d hybridization, the d orbital that participates in hybridization is
- A) $dx^2 - y^2$
 - B) dz^2
 - C) dxy
 - D) dxz

ENGLISH:

91. Which is not a past form of a verb.
- A) Was
 - B) Had
 - C) Looked
 - D) Spoke
 - E) Hear
92. Which contains an adjective?
- A) Old man
 - B) On Tuesday
 - C) She said
 - D) And you
 - E) Afternoon
93. Which contains an adverb
- A) Full house
 - B) Three women
 - C) Was dirty
 - D) Very funny
 - E) Early morning
94. Which is not correct
- A) In February
 - B) On 5:00 o'clock
 - C) At my house
 - D) Near me
 - E) On May 2

Choose the incorrect word for Question # 95 to 97

95. Sharks differ from other fish in that Their skeleton are made of cartilage instead bone
A B C O

96. The hormone insulin controls over the amount of sugar in the blood which provides
A B C D

Energy for the body.

97. I use a bike both to ride to school and going to market

Which one of the following four options is nearest in meaning to the word in capitals?

98. ASTOUND

- A) Shock
- B) Confer
- C) Condescend
- D) Strengthen

99. SCOEF

- A) Cleans
- B) Mock
- C) Scrutinize
- D) Stifle

100. WISP

- A) Tuft
- B) Pack
- C) Smell
- D) Spry